

5. FLYASH, DOWATERING AND FUEL STABILIZATION SYSTEM

- 1) SYSTEM DESCRIPTION: CONTRACTOR SHALL PROVIDE A FACTORY ASSEMBLED AND TESTED SYSTEM FOR THE CONTINUOUS FILTRATION AND DENATURING OF THE STORED EMERGENCY FUEL OIL. THE REMOVAL OF SOLIDS FROM THE FUEL OIL WILL BE ACCOMPLISHED BY PERIODIC TESTING OF FLOW CONTROL AND FUEL TRANSFER SYSTEMS AND AUTOMATIC FUEL STORAGE ADDITIVE INJECTION INTO THE STORED FUEL. THE SYSTEM SHALL BE DESIGNED TO FILTER AND TREAT THE FUELS FROM TWO 1000 GALLON STORAGE TANKS FILLED WITH #2 DIESEL FUEL. AS AN ALTERNATE, THE ENTIRE CONTENTS OF ONE MAIN TANK MAY BE CIRCULATED THROUGH THE SYSTEM. THE SYSTEM SHALL MAINTAIN THE INTEGRITY OF THE SYSTEM PIPING TO THE MAIN FUEL TRANSFER PUMP, AND, IN ADDITION, THE MAIN FUEL TRANSFER SET SHALL BE CHECKED AT LEAST ONCE EVERY 24 HOURS. IN ADDITION, THE SYSTEM'S GENERATOR SUPPLY WATER SHALL BE CIRCULATED AND EXCHANGED REGULARLY WITH THE TREATED AND FILTERED OIL FROM THE MAIN STORAGE TANK.
- 2) WATER REMOVED FROM THE FUEL SHALL BE STORED IN A CORROSION PROOF DOUBLE WALL CONTAINER UNTIL DISPOSAL CAN BE ARRANGED.
- 3) DETAILED MECHANICAL SPECIFICATION: ALL OF THE COMPONENTS DESCRIBED HEREIN SHALL BE FACTORY MOUNTED ON A STRUCTURAL STEEL BASE WITH INTEGRAL STEEL CONTAINMENT LIFT. THE SAME SHALL BE PROVIDED TO SUPPORT THE FUEL TRANSFER PUMPING AND STRAINING SYSTEM DESCRIBED ELSEWHERE IN THIS SPECIFICATION.
- 4) ALL OF THE COMPONENTS DESCRIBED HEREIN SHALL BE FACTORY MOUNTED ON A 1/4" STRUCTURAL STEEL BASE WITH INTEGRAL STEEL CONTAINMENT LIFT FABRICATED OF WIDE STRUCTURAL STEEL CHANNEL SEAM WELDED TO THE STEEL BASE TO FORM A LEAK-TIGHT JOINT.
- 5) THE CONTRACTOR SHALL COUNT THE BASE IN PLACE AT TIME OF INSTALLATION TO MINIMIZE THE GENERATION OF NOISE BY THE PLUMPS.
- 6) THE CONTAINMENT LIFT AND BASE SHALL EXTEND BEYOND ANY FITTING, VALVE, PUMP OR STOPPER. ANY FUEL LEAVING FROM ANY COMPONENT, FITTING, OR PACKING IN THE SYSTEM SHALL BE CONTAINED BY THE CONTAINMENT LIFT.
- 7) A LIQUID DETECTOR SHALL BE FURNISHED TO PROVIDE AN AUDIBLE AND VISUAL ALARM SHOULD ANY LIQUID ACCUMULATE WITHIN THE BASE. LEAK DETECTOR EQUAL TO APPROXIMATE UTILITIES TYPE RSH-1H.
- 8) THE FUEL MAINTENANCE SYSTEM SHALL CONNECT TO EACH MAIN STORAGE TANK AT THE LOWEST POINT IN THE TANK SO THAT ANY WATER ACCUMULATING FROM LEAKAGE, CONTAMINATED FUEL DELIVERY, OR CONDENSATION WILL BE DRAWN INTO THE FILTER AND TANK. A SECOND CONNECTION TO THE TANK SHALL BE MADE ABOVE THE FIRST AND BELOW THE LOW POINT OF THE TANK SHALL BE USED AS THE INLET TO THE FUEL OIL TANK. THESE INLETS MUST ELIMINATE THE POSSIBILITY OF DRAWING WATER OR SEDIMENT INTO THE ENGINE FUEL SYSTEM.
- 9) UPON ENTERING THE FUEL MAINTENANCE SYSTEM, THE FUEL SHALL PASS THROUGH A DUPLEX STRAINER SIZED TO MATCH THE SUCTION LINE. THIS STRAINER SHALL BE CAPABLE OF REMOVING ALL SOLIDS FROM THE FUEL. IT SHALL BE CLEANED OF DEBRIS PARTICLES AND FOREIGN MATTER FROM THE FUEL. A SINGLE SHOCK HANDLE SHALL BE PROVIDED TO ACTUALLY ISOLATE THE OTHER SO THAT IT MAY BE INSPECTED AND CLEANED WITHOUT SHUTTING DOWN THE SYSTEM. THIS STRAINER SHALL BE CAST IRON BUILT WITH A BRONZE PLUG TYPE SELECTOR VALVE. THE UNIT SHALL BE RATED FOR 125 PSI OIL PRESSURE AND SHALL BE PREPARED UTILITIES TYPE SO OR APPROVED EQUAL.
- 10) AFTER LEAVING THE DUPLEX STRAINER, THE FUEL SHALL ENTER A SEAFOF FILTER AND ENCLOSURE WITH THIS UNIT SHALL BE HOUSED IN A RUBBER, EPOXY COATED STEEL FRAMEWORK WITH REMOVABLY FASTENER COVER, TOP FITTED WITH AN INTEGRAL WATER CONTAINMENT SUMP AND ELECTRONIC WATER DETECTOR.
- 11) THE FUEL SHALL FIRST PASS THROUGH A TURBINE TYPE WATER SEPARATION UNIT TO REMOVE THE LARGE WATER REMOVAL ELEMENTS. THE WATER REMOVED SHALL PASS THROUGH THE TURBINE TO THE TEMPORARY WATER HOLDING SUMP.
- 12) THE OIL SHALL THEN PASS THROUGH A RESIN IMPREGNATED CELLULOSE WATER COALESCENCE UNIT WHICH IS DESIGNED TO REMOVE ALL GLYCEROL WATER AND TO DRAW OUT MOISTURE FROM THE TEMPERATURE CONTAINMENT SUMP. THE SYSTEM SHALL BE DESIGNED TO REMOVE THE MOISTURE CONTENT OF THE EXITING FUEL TO LESS THAN 10 PPm.
- 13) AFTER THE WATER REMOVAL STAGES, THE FUEL SHALL PASS THROUGH A POLISHING FILTER WITH A BACK REMOVAL DIFFICULTY FOR PARTICLES LARGER THAN .005 MICRONS.
- 14) THE WATER REMOVAL AND SOLIDS REMOVAL ELEMENTS SHALL BE FIELD REPLACED WITHOUT SPECIAL TOOLS. THE FILTER UNIT ENCLOSURE SHALL BE FITTED WITH A COMPLETE TIGHT COVER TO PREVENT AIRING SEAL. THE UNIT SHALL BE SUPPLIED CHARGED WITH ELEMENTS INSTALLED AND READY TO REPLACE SET REPLACEMENT FILTER CARTRIDGES.
- 15) A DIFFERENTIAL PRESSURE INDICATOR SHALL BE INSTALLED AROUND THE FILTER UNIT TO PROVIDE A VISUAL WARNING OF WHEN THE FILTER ELEMENTS ARE NEAR FAILURE. A DIFFERENTIAL PRESSURE SWITCH SHALL BE INSTALLED TO PROVIDE AN ALARM WHEN THE FILTER ELEMENTS REQUIRE REPLACEMENT.
- 16) THE FUEL MAINTENANCE SYSTEM SHALL BE PROVIDED WITH AN OIL CIRCULATING PUMP. THE PUMP SHALL BE CAPABLE OF CIRCULATING FUEL AT 12 GALLONS PER MINUTE OF DIESEL FUEL THROUGH THE FILTRATION AND DENATURING SYSTEM.
- 17) OIL PUMP SHALL BE POSITIVE DISPLACEMENT, CAST IRON BODY, PRECISION-BALANCED AND PORTABLE TO BE OPERATED BY HAND OR BY SELF-ACTUATING BRAKE-N-MECHANICAL PUMP SEAL AND BALL BEARING DRIVE SHAFT SUPPORT.
- 18) PUMP SHALL BE COUPLED VIA FLEXIBLE COUPLING TO A 3/4 HP, NEMA FRAME, 1750 RPM, THREE PHASE, OPEN DRIP PROOF MOTOR.
- 19) MOTOR AND PUMP SHALL BE PRECISION ALIGNED AND MOUNTED TO A STRUCTURAL STEEL BASE.
- 20) THE MOTOR AND PUMP ASSEMBLY SHALL BE MOUNTED TO THE COMMON BASEPLATE VIA SYNTHETIC RUBBER VIBRATION ISOLATORS. ELECTRICAL AND PIPING CONNECTIONS SHALL BE REMOVABLE TO MINIMIZE NOISE AND VIBRATION TRANSMISSION INTO THE BUILDING.
- 21) PROVIDE FLOW SENSORS IN THE PUMP DISCHARGE TO SIGNAL FAILURE OF THE SYSTEM.
- 22) A BRONZE BODY GEAR PUMP SHALL BE FURNISHED TO PUMP THE WATER FROM THE FILTER HOUSING SUMP TO THE HOLDING TANK.
- 23) THIS PUMP SHALL BE FURNISHED WITH CARBON BUSHINGS, STAINLESS STEEL SHAFTS, AND A PORTABLE MECHANICAL SEAL. CAPACITY SHALL EXCEED THE WATER REMOVAL RATING OF THE COALESCING UNIT.
- 24) THE WATER TRANSFER PUMP SHALL BE MOUNTED AND PIPED WITH VIBRATION ISOLATORS SIMILAR TO THOSE UTILIZED FOR THE OIL PUMPS.
- 25) PROVIDE AN ELECTRICALLY OPERATED VALVE BETWEEN THE SUMP AND THE WATER TRANSFER TANK TO PREVENT FLOW OF WATER INTO THE FUEL OIL, OR FUEL INTO THE WATER HOLDING TANK WHEN THE SYSTEM IS IDLE.
- 26) PROVIDE RELIEF VALVES FOR EACH OF THE PUMPS. RELIEF VALVES SHALL BE SIZED TO PERMIT THE FULL FLOW OF THE PUMP WITHOUT OVERLOADING THE PUMP DRIVE MOTOR. RELIEF VALVES SHALL BE CONSTRUCTION OF 300 PSI BRONZE BODY, ADJUSTABLE SPRING AND STAINLESS STEEL BALL.
- 27) ALL WATERS REMOVED FROM FUEL SHALL BE PUMPED AUTOMATICALLY TO A HOLDING TANK. HOLDING TANK SHALL BE POLYESTER RESIN AND SHALL HAVE CAPACITY OF NOT LESS THAN 20 GALLONS.
- 28) HOLDING TANK SHALL BE INSTALLED IN A SECONDARY CONTAINMENT VESSEL OF EQUAL CONSTRUCTION.
- 29) THE HOLDING TANK SHALL BE EQUIPPED WITH A HIGH LEVEL SWITCH TO SOUND AN ALARM, LIGHT A LIGHT AND SHUT DOWN THE FUEL MAINTENANCE SYSTEM UNTIL THE TANK IS EMPTY.
- 30) THE HOLDING TANK SHALL BE FULLY ENCLOSED AND FURNISHED WITH A PEI PIPE FOR CONNECTION TO THE FUEL MAINTENANCE SYSTEM. A VENT TUBING, HIGH LEVEL TUBING, AND DIP TUBE TO ALLOW DIPS TO WITHDRAWAL OF THE WASTE WATER FOR DISPOSAL.
- 31) A WELDED STEEL CHEMICAL ADAPTOR HOLDING TANK SHALL BE MOUNTED ON THE MAIN BASEPLATE.
- 32) A POSITIVE DISPLACEMENT METERING PUMP SHALL DIRECT ADDITIVE INTO THE OIL WHILE THE OIL IS CIRCULATING IN ORDER TO ASSURE CONSTANT DOZING.
- 33) PUMP SHALL BE TOTALLY ENCLOSED 1/3 HP MOTOR, CAST IRON PUMP BODY, STAINLESS STEEL TRIM AND TEFLON GRAPHITE.
- 34) OUTPUT OF PUMP SHALL BE ADJUSTABLE FROM 0% TO 100% OF CAPACITY TO TRIM THE AMOUNT OF ADDITIVE DELIVERED DURING EACH OPERATING CYCLE.
- 35) CONTROL SYSTEM SHALL AUTOMATICALLY OPERATE THE METERING PUMP FOR A PRESET PERIOD DURING EACH MANUALLY INITIATED ADDITIVE CYCLE TO MAINTAIN AN EFFECTIVE LEVEL OF FUEL STABILIZER IN THE MAIN TANK.
- 36) ALL PIPING IN THE FUEL MAINTENANCE SYSTEM SHALL BE SUITABLE FOR THE FLUIDS HANDLED
- 37) FUEL PIPING SHALL BE STANDARD WEIGHT MALLEABLE IRON WITH SCREWED FITTINGS.
- 38) WATER PIPING SHALL BE COPPER WITH HARD SOLDERED SHUNT FITTINGS OR THREADED BRASS PIPE AND FITTINGS.
- 39) NO FLUIDS WITHIN THE SYSTEM SHALL BE CONTAINED BY NON-METALLIC TUBING OR NOSE.
- 40) FURNISH VALVES WHERE SHOWN ON THE DRAWINGS, AND WHERE REQUIRED FOR THE OPERATION OF THE SYSTEM AND TO ALLOW ANY COMPONENT TO BE REMOVED WITHOUT DAMAGING THE ENGINE SYSTEM.
- 41) SHUTOFF VALVES SHALL BE BRONZE BODY BALL VALVES WITH STAINLESS STEEL BALL AND STEM, 150 CLASS.
- 42) CHECK VALVES SHALL BE "Y" CONSTRUCTION, SWING TYPE BRONZE BODY WITH REPAIRABLE METAL TO METAL SEAL.
- 43) FURNISH GAUGES AT THE INLET AND DISCHARGE OF EACH FILTER OR PUMP.
- 44) GAUGES SHALL BE LIQUID FILLED, 4" DIAMETER WITH BUILT IN PULSATON DAMPENER AND STAINLESS STEEL CASE.
- 45) UNLESS OTHERWISE NOTED, ALL GAUGES FOR THE FUEL MAINTENANCE SYSTEM SHALL BE COMPOUND TYPE WITH 30" HG VACUUM TO 15 PSIG PRESSURE RANGE TO ACCOMMODATE THE EXPECTED OPERATING PRESSURES FOR THIS LOW PRESSURE SYSTEM.

6. FUEL OIL MANAGEMENT AND LEVEL CONTROL CENTER

- SEQUENCE OF OPERATION
- 1) A CONTROL AND ANNUNCIATION SYSTEM SHALL BE PROVIDED AS DESCRIBED HEREIN TO MONITOR THE PERFORMANCE OF THE FUEL MAINTENANCE SYSTEM AND TO ALERT THE PLANT PERSONNEL OF EXCESSIVE CONTAMINATION OF THE FUEL SUPPLY, LOSS OF PUMP PRIME FOR THE MAIN TRANSFER SYSTEMS, FAILURE OF THE MAIN TRANSFER SYSTEM TO PROVIDE FLOW ONLY, FILLED FILTER CARTRIDGE OR FILLED WATER STORAGE RESERVOIR, PROVIDING A WARNING PANEL FOR REMOTE MOUNTING TO DUPLICATE ALL STATUS AND ALARM INFORMATION.
 - 2) MAIN TRANSFER PUMPS
 - a) THE CONTROL SYSTEM SHALL CAUSE THE LEAD AC DRIVEN PUMP TO START WHENEVER A REMOTE CONTROL IS CLOSED INDICATING THAT THE GENERATORS ARE TO OPERATE.
 - b) UNDER AC OPERATION, THE LEAD PUMP SHALL ESTABLISH FLOW AT THE DISCHARGE OF THE PUMP SET. SHOULD FLOW NOT BE ESTABLISHED WITHIN 10 SECONDS OF A CALL FOR OPERATION, THE LEAD PUMP SHALL BE DE-ENERGIZED AND THE LAG PUMP SHALL START.
 - c) SHOULD THE LAG PUMP NOT ESTABLISH FLOW, A "TOTAL PUMP FAILURE" ALARM SHALL BE ELUATED AND THE ALARM HORN SHALL SOUND, AND REMOTE INDICATION TO GENERATOR ROOM CONTROL, COMPUTER AND BMS.
 - 3) PERIODIC SELF TEST OF FUEL DELIVERY SYSTEM
 - a) THE PLC CONTROLLER SHALL GENERATE A "GENERATOR RUN" SIGNAL TO CALL THE MAIN TRANSFER PUMPS INTO OPERATION.
 - b) A CHECK TIMER SHALL START, AND AN ALARM SHALL SOUND IF THE FUEL FLOW TO THE GENERATOR SUPPLY MAINTAINED DOES NOT REACH A NORMAL VALUE WITHIN THE CHECK TIME PERIOD.
 - c) AN ALARM LIGHT SHALL LIGHT TO INDICATE THAT THE SYSTEM HAS FAILED ITS FLOW TEST CYCLE.
 - d) THIS TEST SHALL BE AUTOMATICALLY SUSPENDED IF ANY ALARM CONDITIONS ARE LOGGED DURING THE PRECEDING PHASES OF THE FUEL MAINTENANCE AND SYSTEM TEST CYCLE.
 - 4) FILTRATION AND DETERMINING SYSTEM CONTROL LOGIC
 - a) THE OPERATION OF THE FUEL MAINTENANCE SYSTEM SHALL BE MANUALLY INITIATED WHENEVER A DELAYED FLOW OF FUEL IS MADE TO THE FACILITY, OR AFTER THE FUEL HAS BEEN IDE FOR A PREDETERMINED PERIOD OF TIME.
 - b) TIME OF OPERATION SHALL BE ADJUSTABLE TO MEET SUFFICIENT CHEMICALS TO TREAT 1000 TO 1500 GALLONS OF FUEL. A SELECTOR SWITCH SHALL SELECT 1000, 2000 THROUGH 9000 GALLON TREATMENT CYCLES.
 - c) WHEN THE WATER SWAMP IN THE FILTER ENCLOSURE FILLS WITH WATER, A SOLID STATE WATER DETECTOR SHALL CAUSE A SOLENOID AND PUMP IN THE DISCHARGE OF THE WATER SWAMP TO OPERATE, TRANSFERRING THE ACCUMULATED WATER TO THE HOLDING TANK.
 - d) IF THE WATER TRANSFER PUMP CANNOT KEEP UP WITH THE AMOUNT OF WATER BEING REMOVED, THE OIL CIRCULATING PUMPS SHALL SHUT DOWN UNTIL THE WATER CAN BE CLEARED FROM THE SWAMP. NO WATER SHALL BE RETURNED FROM THE SYSTEM TO THE MAIN OIL STORAGE TANK.
 - e) AN ALARM SHALL SOUND AND AN ENGLISH LANGUAGE MESSAGE SHALL BE DISPLAYED INDICATING THAT THIS HAS OCCURRED AND THAT THE OIL IN THE MAIN STORAGE TANK HAS BECOME SEVERELY CONTAMINATED WITH WATER.
 - f) THIS ALARM SHALL REQUIRE A MANUAL RESET ACTION TO EXTINGUISH SO THAT THE ALARM WILL REMAIN VISIBLE AFTER THE SYSTEM RETURN TO OPERATION WHEN THE WATER IS FINALLY CLEARED.
 - g) PRESSING THE "START ADDITIVE CYCLE" PUSH-BUTTON AND SELECTING THE AMOUNT OF FUEL TO BE TREATED SHALL ARM THE ADDITIVE PUMP CIRCUIT. THE ADDITIVE FEED PUMP SHALL OPERATE DURING THE NEXT CIRCULATING PUMP OPERATING PERIOD.
 - 5) AUTOMATIC TANK SELECTION LOGIC
 - a) THE MAIN FUEL OIL CONTROL SYSTEM SHALL PROVIDE FOR AUTOMATIC SELECTION OF THE MAIN STORAGE TANK IN SERVICE BASED ON THE MEASURED LEVEL IN THE TANK.
 - b) WHEN THE LEVEL IN THE MAIN TANK IN USE DROPS TO THE LOW LEVEL SETTING IN THE TANK GAUGE, THE LOGIC SHALL SWITCH TO THE OTHER TANK, PROVIDED THAT THE TANK IS ABOVE THE LOW LEVEL ALARM SETTING.
 - c) WHEN TRANSFERRING BETWEEN TANKS, THE LOGIC SHALL OPEN THE SUPPLY VALVE FOR THE TANK BEING BROUGHT INTO SERVICE. WHEN THIS VALVE IS PROVEN OPEN, THE LOGIC SHALL CLOSE THE RETURN VALVE FOR THE TANK BEING BROUGHT INTO SERVICE.
 - d) WHEN THE SUPPLY VALVES HAVE BEEN PROVEN TO BE TRANSFERRED, THE LOGIC SHALL OPEN THE RETURN VALVE FOR THE TANK BEING BROUGHT INTO SERVICE. WHEN THIS VALVE IS PROVEN OPEN, THE LOGIC SHALL CLOSE THE RETURN VALVE FOR THE TANK BEING BROUGHT INTO SERVICE. IF TANK SELECTION IS PERFORMED MANUALLY, THE LOGIC SHALL PROVIDE OVERLAP BETWEEN TANKS ANY TIME THE TANK SELECTION IS CHANGED TO PREVENT OPERATION WITHOUT A SUPPLY AND RETURN PATH FOR OIL AT ALL TIMES.
 - e) LOGIC SHALL CONTINUOUSLY CHECK THAT THE SUPPLY AND RETURN VALVES ARE OPEN FOR THE TANK SELECTED AND CLOSED FOR THE TANKS OUT OF SERVICE. SHOULD ANY VALVE FAIL TO MAINTAIN THE CORRECT POSITION FOR THE TANK SELECTED, AN ALARM LIGHT SHALL SOUND AND THE HORN SHALL SOUND. ALARM CONTACTS SHALL BE AVAILABLE FOR THE CONNECTION OF REMOTE ALARMS.
 - f) THE TWO TANKS WILL SHARE A COMMON FILL LINE. THE FILL LINES TO EACH TANK SHALL CONTAIN MOTORIZED VALVES. THE SECURED TANK'S FILL VALVE SHALL OPEN AND THE IN-SERVICE TANK'S FILL VALVE SHALL CLOSE. LOGIC SHALL ALARM FOR A DELIVERY TO THE SECURED TANK.
 - g) THE CONTROL SYSTEM SHALL MONITOR THE POSITION OF ALL MOTORIZED VALVES, AND SHALL ALARM SHOULD ANY VALVE NOT MOVE TO THE DESIRED POSITION WITHIN ONE MINUTE. A MESSAGE SHALL DESIGNATE WHICH VALVE IS MISPOSITIONED.
 - 6) CONTROL CABINET
 - 1) PROVIDE ONE (1) CONTROL CABINET FOR THE CONTROL OF THE PUMP SET, FUEL OIL FILTRATION SYSTEM, LEAK MONITORING AND TANK GAUGING SYSTEM. CABINET SHALL BE MODEL LCC-WH-1N.
 - 2) PROVIDE FREE-STANDING FACTORY-ASSEMBLED STEEL ENCLOSURE WITH INDICATORS, LIGHTS, SWITCHES, INDICATING LIGHTS, AND MAIN STORAGE TANK GAUGES ON CABINET FRONT AND REAR. PLC CONTROLLER LOGIC AND OTHER COMPONENTS MOUNTED ON CABINET FRONT SUB-BASIS. PROVIDE NEMA 12 CONSTRUCTION WITH FULL LENGTH LIGHTING CANOPIES. THE CONTROL CABINET SHALL BE SIZE AS FOLLOWS: 36" W X 36" D X 20" H. CABINET SHALL HAVE LOCKING REAR DOORS TO ALLOW ACCESS TO INTERNALLY MOUNTED TERMINAL STRIPS, FUSES, ETC.
 - 3) CABINET SHALL BE CONSTRUCTED OF 11 GAGE STEEL WITH WELDED SEAMS. CORNERS SHALL BE GROUNDED SMOOTH AND FILLED. DOORS SHALL BE CONSTRUCTED OF 14 GAGE STEEL WITH KEY-LOCK WASHER HANDBLES AND THREE POINT LATCHES. ALL DOORS SHALL BE FULLY CALIBRATED TO NEMA 12 STANDARDS. ALL METAL SURFACES SHALL BE CLEANED, PHOSPHATIZED, PRIMERED AND FINISHED. INTERIORS SHALL BE GLOSS WHITE ENAMEL. INTERIORS SHALL BE GRAY TEXTURED POLYURETHANE ENAMEL TO PROVIDE RESISTANCE TO FUEL OILS, SOLVENTS AND ABRASIONS.
 - 4) PROVIDE ENGRAVED PLASTIC LABELLED NAMEPLATES FOR ALL DEVICES ON FRONT OF CABINET. NAMEPLATES SHALL HAVE WHITE LETTERS ON BLACK BACKGROUND, AND SHALL BE SECURED TO THE CABINET FRONT WITH STAINLESS STEEL RIVETS.
 - 5) ALL CABINET MOUNTED DEVICES SHALL OCCUPY THE UPPER PORTION OF THE CABINET FRONT, AND FRONT PANEL MOUNTED CONTROL ITEM SHALL BE MOUNTED LESS THAN 36" FROM THE FLOOR.
 - 6) ALL DEVICES MOUNTED WITHIN THE CABINET, INCLUDING THE LOOP CONTROLLERS, SHALL BE APPROPRIATELY RECOGNIZED. THE CABINET SHALL BE MANUFACTURED BY NATIONALLY RECOGNIZED TRADE UNION PERSONNEL. ALL CABINET MOUNTED DEVICES AND CONSTRUCTION METHODS SHALL BE IN COMPLIANCE WITH UL 508. THE CABINET SHALL BE LABELLED AS COMPLYING WITH UL 508 BY AN OSHA NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) SUCH AS UL, ETL OR EQUAL. THE SYSTEM MANUFACTURER SHALL BE INSPECTED QUARTERLY BY A NRTL TO INSURE CONTINUED COMPLIANCE WITH UL 508 CONSTRUCTION REQUIREMENTS.
 - 7) PANEL SHALL BE FACTORY WIRED AND TESTED TO INCLUDE REQUIRED ITEMS TO MAINTAIN AND TO PROVIDE FOR AUTOMATIC CHANGEOVER FROM PUMP TO THE OTHER AND OPERATION OF STAND-BY PUMP SHOULD THE FLOW OR LEVEL IN THE HEADER FALL BELOW THE LOW ALARM SETTING OF THE LEVEL CONTROL ASSEMBLY.
 - 8) THE CONTROL CABINET SHALL BE MANUFACTURED AND WIRED BY THE PUMP SET MANUFACTURER, NOT AN OUTSIDE PANEL SHOP. ALL NECESSARY ITEMS REQUIRED TO PROVIDE THE CONTROL SEQUENCE OUTLINED ABOVE SHALL BE MOUNTED AND PRE-WIRED WITHIN THE CABINET, INCLUDING BUT NOT LIMITED TO:
 - a) ONE (1) VOLTAGE STABILIZING TRANSFORMER
 - b) ONE (1) POWER ON LIGHT
 - c) FIVE (5) ETN TIME ELAPSE RECORDERS TO MEASURE RUNNING TIME FOR EACH MAIN AC DRIVEN TRANSFER PUMP, THE FILTRATION CIRCULATING PUMP, WATER REMOVAL PUMP, AND THE CHEMICAL FEED PUMP.
 - d) FIVE (5) PILOT LIGHTS TO INDICATE PUMP IN OPERATION FOR EACH OF THE ABOVE PUMPS.
 - e) FIVE (5) HAND-OFF AUTO SWITCHES, ONE FOR EACH PUMP.
 - f) ONE (1) PUMP CONTROL LOGIC PLC UNIT
 - g) ONE (1) LEAD PUMP SELECTOR SWITCH THREE POSITION FOR SELECTION OF TANK 1, TANK 2, OR AUTOMATIC TANK SELECTION.
 - h) ONE (1) FILL VALVE SELECTOR SWITCH, THREE POSITION FOR SELECTION OF TANK 1, TANK 2, OR AUTOMATIC TANK SELECTION.
 - 9) SYSTEM MAIN DISCONNECT
 - a) GE FANUC 9030 PLC CONTROL SYSTEM
 - 10) ALARM HORN
 - 11) FILTRATION CYCLE DURATION SELECTOR SWITCH
 - 12) CHEMICAL ADDITION CYCLE DURATION SELECTOR SWITCH
 - 13) PUSH BUTTONS FOR THE FOLLOWING:
 - (1) FUEL FILTRATION CYCLE START PUSH BUTTON
 - (2) FUEL FILTRATION CYCLE CANCEL PUSH BUTTON
 - (3) FUEL ADDITIVE CYCLE START PUSH BUTTON
 - (4) FUEL ADDITIVE CYCLE CANCEL PUSH BUTTON
 - (5) LAMP TEST
 - (6) ALARM ACKNOWLEDGE
 - (7) ALARM SILENCE
 - 10) ALPHANUMERIC DISPLAY WITH FOUR (4) FORTY (40) CHARACTER LINE DISPLAY MEDIUM FOR DISPLAY OF ALL STATUS AND ALARM MESSAGES. PROVIDE MESSAGES FOR THE FOLLOWING:
 - (1) LOW HEADER LEVEL ALARM
 - (2) HIGH HEADER PRESSURE ALARM
 - (3) LEAD PUMP FAILURE ALARM
 - (4) ALARM AND ANNUNCIATION FOR EACH RSS AND HD-A1 LEAK SWITCH IN THE SYSTEM
 - (5) FAILURE DURING FLOW TEST
 - (6) EXCESS WATER IN FUEL ALARM
 - (7) WATER STORAGE TANK FULL ALARM
 - (8) STRAINER DIRTY ALARM (3)
 - (9) FILTER DIRTY ALARM
 - (10) LEAKAGE INTO SYSTEM DRIP PAN ALARM
 - (11) LEAKAGE INTO WATER SECONDARY CONTAINMENT ALARM
 - (12) LOSS OF FLOW, FILTRATION CYCLE
 - (13) ADDITIVE TANK EMPTY
 - (14) MAIN STORAGE TANK HIGH LEVEL (2)
 - (15) MAIN STORAGE TANK LOW LEVEL (2)
 - (16) FAILURE OF ANY MOTORIZED VALVE TO MOVE TO THE DESIRED POSITION INDICATE VALVE NUMBER
 - (17) IMPROPER POSITION OF ANY MANUAL VALVE FOR PROPER OPERATION OF ANY PUMP IN AUTOMATIC MODE INDICATE VALVE NUMBER
 - (18) BOTH MAIN TANKS BELOW LOW ALARM POINT
 - (19) LEAK IN FILL LINE (SENSOR AND ELECTRONICS BY OTHERS)
 - 11) DISCREET AND ANALOG OUTPUTS AS REQUIRED TO INTERFACE WITH THE BMS
 - a) TWO (2) TANK DIGITAL LEVEL GAUGES AND LEAK MONITOR AS PREVIOUSLY DESCRIBED.
 - b) ALL CONTROL AND ALARM LOGIC SHALL BE PERFORMED BY A (PLC) PROGRAMMABLE LOGIC CONTROLLER AND NOT ACCOMPLISHED BY RELAY LOGIC.
 - c) ALL ALARMS LISTED ABOVE SHALL BE DUPLICATED BY AN ENGLISH LANGUAGE MESSAGE CENTER LOCATED IN THE ENGINE CONTROL ROOM. COMMUNICATIONS BETWEEN THE MAIN CONTROL CABINET AND THIS SATELLITE DISPLAY SHALL BE VIA A SERIAL DATA COMMUNICATIONS LINK.
 - d) ALL WIRING AND PIPING SHALL BE COVERED BY LABELS OF NATIONALLY RECOGNIZED UNITS. ALL FUEL OR PIPING SHALL BE OF THE SIZES NOTED ON THE DRAWINGS AND SHALL BE SCHEDULED 40 BLACK STEEL. ALL PUMP DISCHARGE PIPING, VALVES AND FITTINGS SHALL BE COMPLETELY FACTORY FABRICATED.
 - e) PROVIDE JOB SPECIFIC LAYOUT DRAWING OF PUMP SET AND CONTROL CABINET TOGETHER WITH COMPLETE WIRING DIAGRAM AND APPROVAL PRIOR TO FABRICATION.
 - 12) QUALITY CONTROL
 - 1) THE PUMP SET, FILTRATION SET, LEVEL CONTROL CENTER, AND REMOTE ANNUNCIATOR SUBSETS SHALL BE THE PRODUCT OF ONE MANUFACTURER. AFTER FABRICATION, PUMP SET SHALL BE GIVEN A HYDROSTATIC TEST AT 125% OF THE NORMAL OPERATING PRESSURE FOR THE SET. ELECTRICAL COMPONENTS SHALL BE FUNCTIONALLY TESTED FOR CHECKING POSITION OF ALL MOTORS, ALL RELIEF VALVES AND CONTROL SETTINGS SHALL BE VERIFIED FOR CONFORMANCE OF THESE SPECIFICATIONS. A CERTIFICATE OF FACTORY TESTING, TOGETHER WITH A COPY OF THE WIRING DIAGRAM SHALL BE PLACED IN THE CONTROL CABINET PRIOR TO SHIPMENT.
 - 2) THE MANUFACTURER SHALL NOTIFY THE ENGINEER WHEN TESTING IS TO TAKE PLACE IN ORDER THAT THE ENGINEER, OWNER OR A REPRESENTATIVE OF THE OWNER MAY EXERCISE THEIR OPTION TO WITHNESS THE TESTING.
 - 3) AFTER TESTING, THE SET SHALL BE PAINTED WITH TEMPERATURE, WATER, AND CHEMICAL RESISTANT ENAMEL. ALL NAME PLATES, GAUGES, BRASS VALVES, SHAFTS AND OTHER MOVING PARTS SHALL BE MARKED AND LEFT UNPAINTED.
 - 4) CONTRACTOR SHALL SUBMIT A COMPLETE BOOKLET CONTAINING SHOP PRINTS AS LISTED BELOW, TOGETHER WITH CATALOG CUTS ON ALL MAJOR COMPONENTS. PARTIAL SUBMITTALS SHALL NOT BE ACCEPTED. NO FABRICATION SHALL COMMENCE UNTIL THE COMPLETE BOOKLET HAS BEEN APPROVED.
 - 13) JOB SPECIFIC DRAWINGS REQUIRED:
 - a) SCALE DRAWING OF PUMP SET SHOWING ALL COMPONENTS WITH BOTH PLAN AND ELEVATION DIMENSIONS.
 - b) SCHEDULE OF COMPONENTS
 - c) CONTROL CABINET LAYOUT WITH DETAILED AND SPECIFIC SEQUENCE OF OPERATION.
 - d) JOB SPECIFIC ELECTRICAL WIRING DIAGRAM
 - e) LAYOUT OF TANK GAUGE/LEAK MONITOR IN PUMP SET CABINET.
 - f) SCALE DRAWING OF FILTRATION, DETERMINING, AND CHEMICAL FEED PUMP SET SHOWING ALL COMPONENTS WITH BOTH PLAN AND ELEVATION DIMENSIONS.
 - g) SCALE DRAWING OF ALL CONTROL CABINETS IN PLAN AND ELEVATION.
 - h) ALL DRAWINGS SHALL BE JOB SPECIFIC. NO CATALOG CUTS OR "